Supporting Patient Centered Computing Through an Undergraduate Nursing Informatics Curriculum Stage III

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The patient has been one of the focal points of the process followed to design, implement, and evaluate an integrated informatics curriculum in a baccalaureate nursing program. This paper describes the third stage of a process to design the informatics nursing courses. A challenge is to structure the nursing informatics curriculum so as to enhance the patient care process. A number of strategies were used to focus the curriculum, students, and faculty around the patient. The basic components of the framework are information, technology, and clinical care process. The clinical care process which emphasizes the patient is an inherent part of the conceptual framework in all aspects of the curriculum. Therefore the faculty has ensured a blend of information, technology, and the clinical care process throughout the curriculum.

PURPOSE

Use of information technology in health care continues to increase dramatically. Preparing health care professionals to utilize these resources is a challenge that needs to be addressed by educational programs. Therefore this paper will describe the collaboration process used to design, implement and evaluate an integrated informatics curriculum currently in place in a baccalaureate nursing program. First time implementation of the third course of a required four course sequence will be discussed as well as the ongoing evaluation of the first and second courses of the curriculum.

BACKGROUND AND REVIEW

Recently the School of Nursing and three area hospitals formed a consortium to launch a new baccalaureate program in nursing. In the Fall of 1990, 101 students were admitted into the inaugural class. Presently there are three classes with 301 students in the program. Of particular interest to this audience is the innovative inclusion of nursing informatics throughout the four years of curriculum. Other key aspects of the program include a focus on acute and critical care nursing, a bedside nursing emphasis, strong clinical experience throughout all four years beginning in the first semester of the curriculum, a development of identity with professional nursing through personal link-ups with nurses in clinical settings, and well defined linkages to the three hospitals. Increase in the use of computer technology and information science in nursing practice, education, and administration demands a new approach to the application of information technology. However, technical competence includes not only equipment competence but skill in the efficient application of information. We are continually challenged to produce a baccalaureate graduate who utilizes information technologies in their clinical practice to improve the patient care process.

CHALLENGE

The implementation of the third course provided the following challenges:

1) To assure nursing students' view of the integration of technology in support of patient care as the appropriate focus of nursing.

2) To develop and implement the third course and closely align it with other nursing courses.

Various strategies were incorporated into the nursing informatic courses to assist students in focusing on the clinical care process. In addition, support of the clinical care process through decision support applications were addressed throughout the third course.

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DESIGN

Informatics courses are designed to articulate with the clinical experience and comprehensive course progression followed by the BSN students. The three basic components of the model identified to provide a framework are information, technology, and clinical care process. A model was developed to illustrate the three aspects of nursing informatics in the undergraduate curriculum (See Figure 1). Each course addresses the three components, however, the emphasis regarding each component varies with each course.

During the first course, the emphasis was on information and technology with an overlap in the clinical care process. In Nursing Informatics II, the primary emphasis is on information and the clinical care process with secondary emphasis on technology. (See Figure 1). In order to successfully focus the curriculum in this direction, the nursing informatics and nursing science faculty consciously worked to develop a collaborative relationship whereby nursing informatics and nursing science theories would be integrated into both curricula.

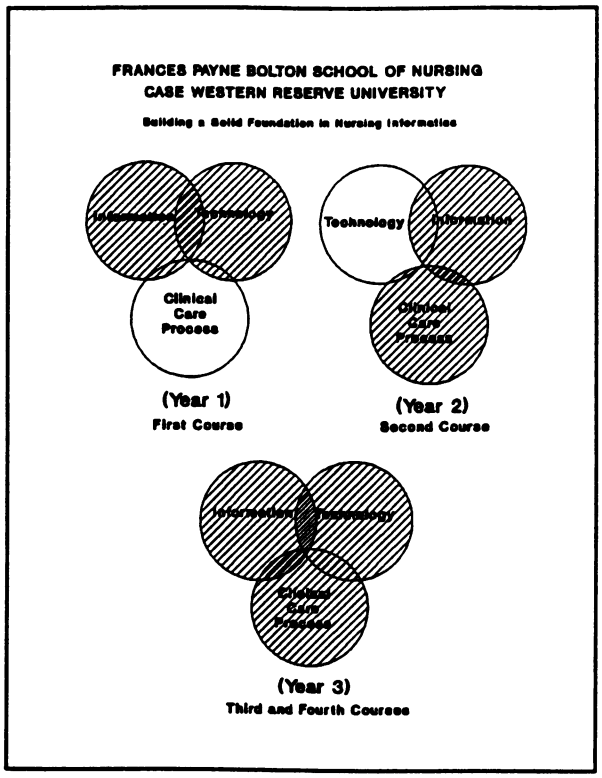

Figure 1

Argyris and Schon [1] suggest that the clinical field experience in a professional nursing program should not be designed merely to give students experience in the real clinical setting to learn accepted practices, but should also provide the student with the opportunity to try out new approaches and modalities of care. To effectively accomplish this, a plan of action was developed to incorporate information technology into the clinical experience.

Each of the mentors and clinical teaching associates attend an all day conference on clinical decision making. The outcome of the conference was two fold: 1) to enhance the student's clinical experience and 2) to increase nursing informatics understanding of nurses interacting directly with the students during clinical practice.

In order to apply classroom concepts to technology a computerized patient charting program, TLC-General Hospital [4], was selected to enhance the second level informatics course and placed in the campus fiberoptics network. As the hospital clinical sites currently lack many of the components of nursing information systems, a broad-based patient charting program introduces the student to those pieces. The course focus is on the process of accessing and documenting as well as the development of critical analysis of the computerized patient care record. This "hands on" introduction to nursing informatics can nurture an exploration of and appreciation for the computerized patient record.

In the third course, Nursing Informatics III: Clinical NIS, the focus is on the overlap of the three components: information, technology, and clinical care process. The course is designed to develop a thorough understanding of current and future states of nursing information systems, physiological monitoring systems, and their potential to provide decision support of patient care. The emphasis is on the use of information technologies to support nursing management in clinical applications.

IMPLEMENTATION

The third nursing informatics course was implemented in the second semester of the third year of the BSN program. The third year of the BSN program includes the specialty courses of community, psych-mental health, pediatrics, and maternal-child. The students continue to use application software packages in the clinical courses. Some examples of application software used are as follows: Nursing Care of Patient with Anxiety, Disorder, Mental

Health Simulation I & II, Maternal High Risk-Cardiac available from MediSim; Musculoskeletal Assessment, Thorax and Lung Assessment available from Lippincott; and ABGee available from Health Sciences Consortium. In addition, some examples of interactive videos that students use are as follows: Nursing Care of the Elderly Cardiac Patient available from American Journal of Nursing Company; Concepts and Care of the Immunosuppressed Patient I & II available from Health Sciences Consortium; and IV Therapy available from Fitne. The software is available through the campus fiberoptic network (CWRUNET) and the interactive videos are available in the multipurpose skills laboratory.

The student enters the third level of informatics ready to relate information technology to decision support at the patient, unit, and system levels. Concepts such as management information systems and operational needs are introduced. Benefits of information technology as well as application of system analysis concepts to the decision making process are included. The process involved in evaluation and selection of the nursing information system are also discussed as well as the degree of fit between the nursing information system and the nursing care delivery system. Lastly, ethical issues related to use and storage of patient related data are addressed. In summary, the third course focuses on the outcomes of application and analysis of information technology as related to the patient care process.

In addition to the specific course requirements other informatics activities are integrated throughout the curriculum. For example, School of Nursing faculty agreed that each student will be required to identify all sources of information obtained and utilized to develop the patient's nursing care plan. Students will indicate whether information was obtained through access to the manual chart, the automated computer systems, through interviews with patient/family or through inter/intradepartmental communication. They will indicate the ease or difficulty of collecting and analyzing patient information and also be required to identify opportunities where information technology could enhance the capture, processing, and communication of their own nursing information. This approach not only reinforces the concepts of information capture and communication, but also gives the student an opportunity to analyze the voluminous data collected and maintained on patients and how to filter that data into clinically relevant information.

EVALUATION - NURSING INFORMATICS III

In "What Curriculum for the Information Age?" edited by Mary Alice White, Julie McGee proposes that the curriculum necessary to equip students for life in the Information Age should emphasize a new hierarchy of skills [4]. This skill set includes the a) ability to evaluate information, b) ability to set priorities, and c) ability to make decisions. These three skills are basic to the students' understanding and application of information technology to support nursing care.

During the freshman nursing informatics course, we evaluated the students' acquisition of knowledge through multiple choice examinations. This format is useful in evaluating the students' knowledge, comprehension, and application of material presented in class and through the reading assignments. Since the second nursing informatics course deals with the access, application and evaluation of information in relationship to the clinical care process, we have decided to evaluate the students' understanding of the principles of nursing informatics and their clinical applications through comprehensive essay examinations.

In the third informatics course, application, analysis, and evaluation are central to the focus of the course. The students are expected to submit papers and perform projects related to system analysis as well as data base development. In addition, communication over the university fiberoptic network (CWRUNET) is encouraged through use of a nursing bulletin board. A synthesis of information is expected in the papers and presentations. It is important that students are able to communicate the summary of their efforts to others.

UPDATE ON NURSING INFORMATICS I, II

The students continue to value the self-paced computer simulation packages used in Nursing Informatics I and II. Assignments continue to reflect application of information technology to patient situations.

CURRICULUM AND PROGRAM EVALUATION

This is the third stage of a longitudinal study to extend over a four year period. Evaluation of outcomes with respect to both students' attitudes and

knowledge acquired occur after each stage. In addition to following the first group of students through the four year period, a comparison between the first group of students and succeeding informatics student groups will occur. Here we report two aspects of the ongoing evaluation. The first is to compare the students experience with nursing informatics. Second is to compare each cohort knowledge and attitudes.

At the end of the present course, the survey previously developed [5] to evaluate the students' knowledge and attitudes toward computers and Nursing Informatics will be readministered so that an ongoing evaluation of changes in knowledge and attitude will be captured.

The instrument to be used for this study is a 30 item questionnaire adapted from McConnell, O'Shea, and Kirchhoff [3], to measure knowledge and attitudes toward computers. Students rate each item on a five point Likert scale. Factor analysis on the first sample supported a three factor structure and deletion of six items. The three scales are scientific use of technology, common misconceptions associated with technological advances, and clinical care process. The scientific use scale is composed of four items regarding the advantages of computer technology in the health care setting. Higher scores indicate more positive knowledge and attitudes. Cronbach's alpha for the scale is .55. The common misconceptions scale has eight items which describe commonly held fears and concerns regarding advances in technology in the workplace. Lower scores indicate more negative knowledge and attitudes. Cronbach's alpha was .83. The 12-item clinical care scale addresses the application of technology to support the nurse in providing patient care. Higher scores indicate more positive knowledge and attitudes. Cronbach's alpha was .85.

Each cohort was assessed at the end of each academic year on knowledge and attitudes. Their ratings were compared across cohorts with oneway Analysis of Variance (ANOVA) and Scheffe tests for post-hoc comparisons. Junior students' ratings of the Clinical Care Process were significantly lower than the freshman students' ratings; sophomores were not different from either group, $F(2, 136) = 4.80$, $p < .01$. Differences on the scientific use and common misconceptions scales were not significant, $F(2, 144) = 1.88$ and $F(2, 143) = 2.51$, p = NS, respectively. This finding is opposite of what we expected. There are several possible reasons for the finding. First, since the response rate ranges from 50 to 75%, the students who completed the survey may differ in some way from those who did not complete the survey. Second, it may be that changes in the class content or presentation and availability of clinical simulation software are responsible for the decrease in scores. Third, since class content is designed to increase students' awareness of what is possible rather than what is currently in place in practice, it is likely that the decrease in students' knowledge and attitude scores are a reflection of their reconciling classroom content with clinical reality.

In order to investigate these explanations, we compared the current ratings by sophomore and junior students with their ratings from the past 1 and 2 years, respectively, with oneway ANOVAs and Scheffe tests. Repeated measures analysis is not possible as we collected data in a way to maintain anonymity for students. Significant decreases in scores across time on the clinical care process were obtained for both juniors and sophomores, $F(2, 207) = 3.82$, $p = .02$ and $F(1, 151) = 27.84$, $p < .001$, respectively. In addition, sophomore scores showed a significant decrease over time for scientific use, $F(1, 157) = 12.95$, $p < .001$, and an increase for misconceptions, $F(1, 159) = 4.03$, $p = .05$. These findings are consistent with the third reason, that students integrate information obtained in the classroom with experience in the clinical area. Thus, students' knowledge and attitudes about nursing informatics becomes less idealistic and more practical with increasing exposure to the clinical arena.

As a component of the on-going evaluation of the implementation of the informatics courses, this spring, selected faculty and a nursing information consultant completed an in-depth review of the the informatics content and its placement. From a review of the faculty and students responses, it appeared that some of the content in the second and third courses could be shifted and other content added. Students continue to ask for more clinical application opportunities. The faculty are continually seeking out additional software programs and reviewing them for possible inclusion into students' experiences.

SUMMARY

The focus on the patient in the clinical care process enhances the impact of information technology. By incorporating information technology in the didactic and clinical portions of courses, faculty have ensured a blend of information, technology, and the clinical

care process. However, the faculty expected the student scores to change positively over time on the clinical care process scale due to increased clincial experiences. But, we believe the decrease in score on the clinical care process scale represents critical thinking on the part of the students. In particular, their ability to identify what is different and to evaluate more clearly what is presently available in clinical practice in comparison to what is in future planning has increased. The informatics strand has equipped students with the necessary tools to evaluate, prioritize, and make decisions in an information-intensive environment.

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